Report No. 83-3

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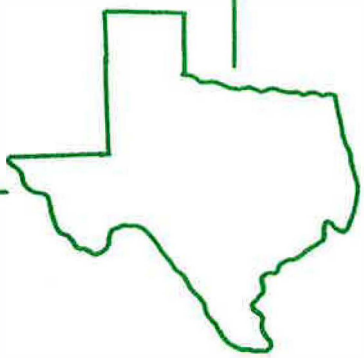
TEXAS FOREST SERVICE

FOREST PEST CONTROL SECTION



Relating Christmas Tree Plantation Management Practices with Numbers of Male Nantucket Pine Tip Moths Captured in Pheromone Traps at the Brockett-Tyree Farms near Winnsboro, Texas during 1982

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INTRODUCTION

Christmas tree production is an expanding business in Texas. Currently there are about 350 Christmas tree farms in Texas and the number increases each year. An estimated 2-3 million trees are sold each year in Texas. Yet only about 100,000 Texas-grown trees were harvested in 1982. The remaining trees were brought in from outside the state. Thus, a large potential market exists for Christmas tree growers in Texas.

Virginia pine is the predominant species grown in Texas for Christmas trees. Growing Christmas trees requires intensive management including site preparation, fertilization, irrigation, pruning, insect control and weed control. A number of insect problems have been encountered in Christmas tree plantations in Texas including aphids, scales, reproduction weevils, town ants, fire ants, and sawflies, but the Nantucket pine tip moth is by far the most important insect problem.

Tip moth larvae mine and kill terminal buds and shoots, thus causing reduced growth and poorly shaped trees. However, trees are rarely killed by tip moth damage. The Nantucket pine tip moth has several generations each year, resulting in repeated attacks on trees throughout the growing season.

Severity of tip moth attacks is often related to host species and cultural practices. Virginia and shortleaf pines are particularly susceptible to tip moth damage, while slash and longleaf pines are resistant. Tip moth damage is often greater on poor sites and in intensively managed plantations where vegetation competition is decreased. Therefore, Christmas tree management practices tend to aggravate tip moth problems.

A number of insecticides, including granular systemic formulations and foliar sprays, are available to Christmas tree growers for controlling the Nantucket pine tip moth. Granular systemic insecticides applied to the soil 1 or 2 times per year have resulted in varying success. Foliar sprays must be applied while young larval stages are exposed and before they enter the shoots. Sprays coinciding with each generation are required to obtain satisfactory control. Late in the summer more frequent sprays may be required to account for overlapping generations.

Ron Billings, Ed Barron, Scott Cameron and Ken Conaway visited the Brockett-Tyree Christmas tree farms near Winnsboro, Texas, on August 27, 1982, to observe the tip moth problem on Virginia pine. The tip moth population was extremely high and damage was severe, particularly in certain plantations. Daryl Tyree discussed the use of tip moth pheromone traps and management practices. The Texas Forest Service, Forest Pest Control Section offered to evaluate the 1982 tip moth control operation at the Brockett-Tyree Farms using data provided by Mr. Tyree.

METHODS

The Brockett-Tyree Christmas tree plantations are located north of Mineola between Quitman and Winnsboro, Texas. Pheromone traps purchased from Albany International were deployed from May 22 through September 23 in 1982, with a few exceptions. Traps were not operated June 24 through 29 and for approximately 3 days at the end of August.

Ten traps were distributed throughout the Hansen field during the entire trapping period, while 10 traps were located in the Suggett field from May through June and five traps from July through September.

A variety of insecticide treatments was used for the control of tip moths during 1982. Orthene was applied five to six times in most fields, Furadan one time in most fields and three times in one field, and aerial applications of parathion were applied to most plantations three times in September. Other cultural treatments included fertilization of certain plantations, irrigation of at least one plantation and shearing in the older plantations two to three times during the year.

Rainfall data from May to September was extracted from climatological records from weather stations located 8 miles east northeast of Mineola and 6 miles southwest of Winnsboro. Rainfall was also recorded by personnel at the Brockett-Tyree Christmas tree plantations. Pheromone trap data were summarized for each of the two fields by moths per trap per day from May to September. The pheromone trap data from the 2-3 year-old and the 4 year-old plantations in the Hansen field were also plotted separately. These data were entered on an Apple III micro-computer and plotted with Apple III graphics.

RESULTS AND DISCUSSION

Rainfall data from three locations are summarized in Figure 1. Rainfall varied considerably in time and amount from one location to another. Rainfall data from the Winnsboro site and the Brockett-Tyree Farms indicate that very dry conditions prevailed from June through September in 1982.

The average numbers of tip moths per trap from May through September

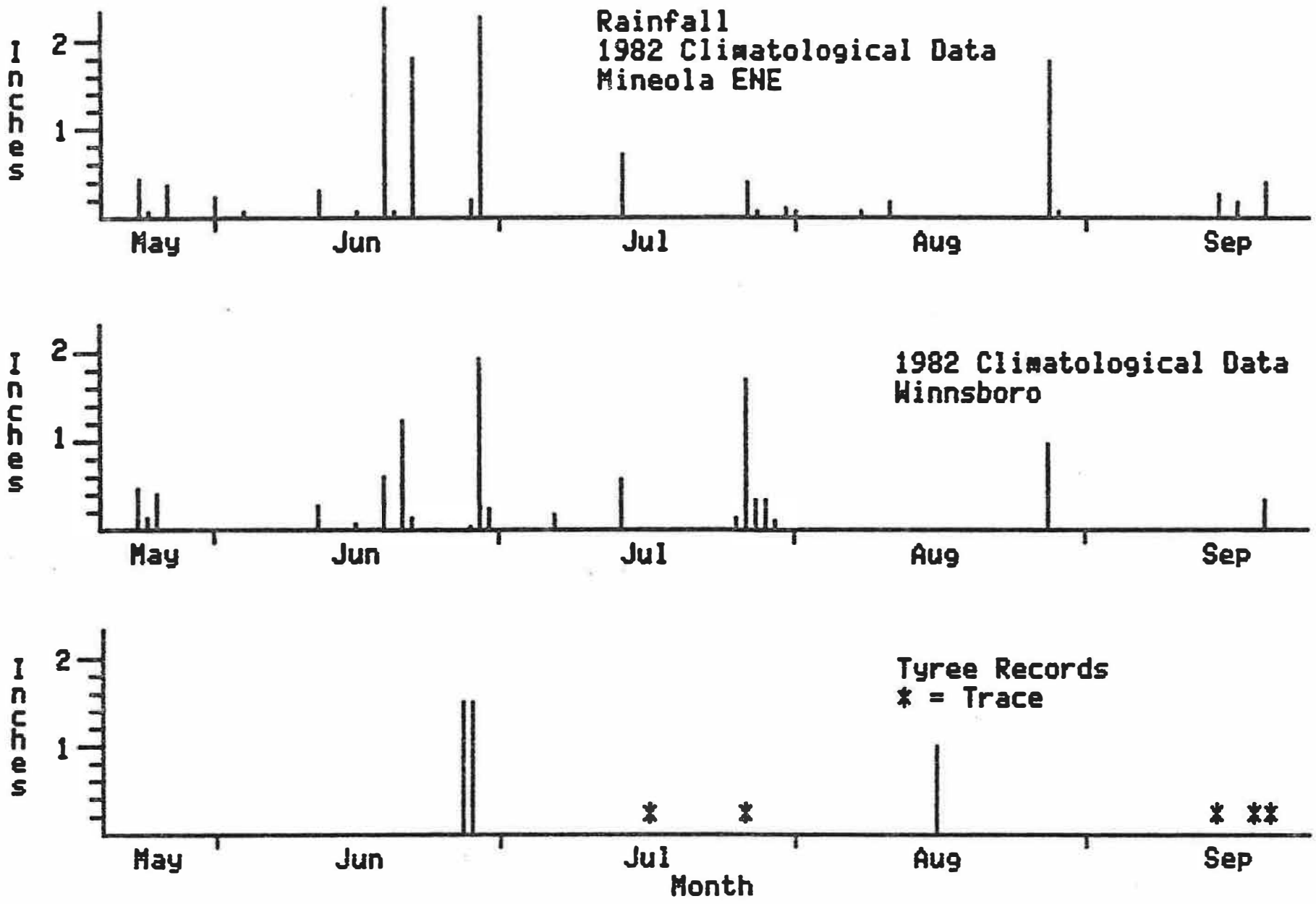


Figure 1. Daily rainfall data from mid-May through late September 1982 for weather stations located 8 miles east northeast of Mineola, Texas and 6 miles southwest of Winnsboro, Texas and at the Brockett-Tyree Farms.

are illustrated for the Hansen field in Figure 2 and for the Suggett field in Figure 3. Three apparent peaks of male moths captured were observed in the Hansen field during early June, late July and late August. Three peaks also were observed in the Suggett field at approximately the same times; however, far fewer moths were caught in the Suggett field than in the Hansen field. Very few moths were captured after the first of September in either field.

It is difficult to determine the number of generations that occurred during 1982 in these Christmas tree plantations because the traps were not operated before May nor after September and because cultural treatments in the fields and other factors may have influenced the numbers of moths caught. However, by comparing the peak numbers of moths captured during 1982 with the moth flight periods near Nacogdoches in 1979 (Anderson 1980), it would appear that five generations may have occurred during 1982 at the Brockett-Tyree Christmas tree farms (Fig. 4).

It was obvious in late August 1982 that levels of tip moth damage varied greatly between plantations. Nearly every terminal was damaged on most trees in the 2-3 year-old plantation in the Hansen field. However, the 4 year-old plantation in the same field contained very little damage and other plantations visited contained varying amounts of damage. Since five pheromone traps were located in each of the two different aged plantations in the Hansen field, these data were summarized separately in Figure 5. The numbers of moths captured from May to June in these two areas were comparable (4 year-old block = 348 moths, 2-3 year-old block = 247 moths.) However, few moths (76) were caught in the 4 year-old block from July to September, while large numbers of moths (676) were caught in the 2-3 year-old block.

Comparisons of possible tip moth flight periods during 1982 with management practices may help explain differences in tip moth damage between plantations. Possible tip moth flight periods and treatments for the Hansen field are illustrated in Figure 6 and for the Suggett field in Figure 7. Since pheromone traps were monitored from late May to late September, the inclusion of March and October peaks is speculative based on information from the literature.

The first 1982 tip moth generation received no insecticide treatment since peak moth flight probably occurred in late March, and Furadan was not applied until late May. This may have allowed moth populations to build up in the plantations early in the year. There was little or no rainfall for a month after the first Furadan application. The insecticide may not have been picked up by the roots and translocated to the growing tips in the trees, leaving them unprotected from second generation larval attacks. Most Orthene sprays appeared to have been applied after tip moth larvae had already entered the shoots. The late July application of Orthene in the Suggett field may have been an exception as this spray appears to have coincided with the young larval stages.

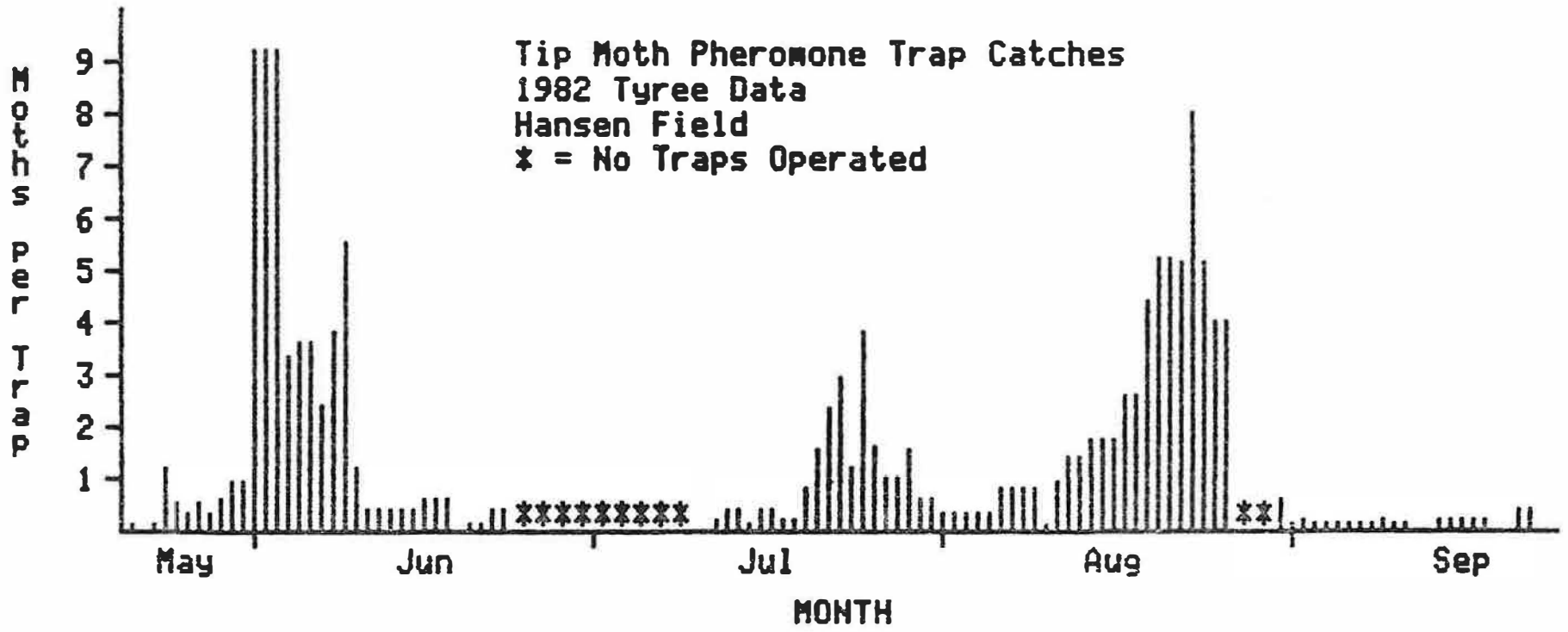


Figure 2. Mean numbers of male Nantucket pine tip moths caught in pheromone traps distributed in the Hansen field Christmas tree plantation at the Brockett-Tyree Farms near Winnsboro, Texas from mid-May through late September in 1982.

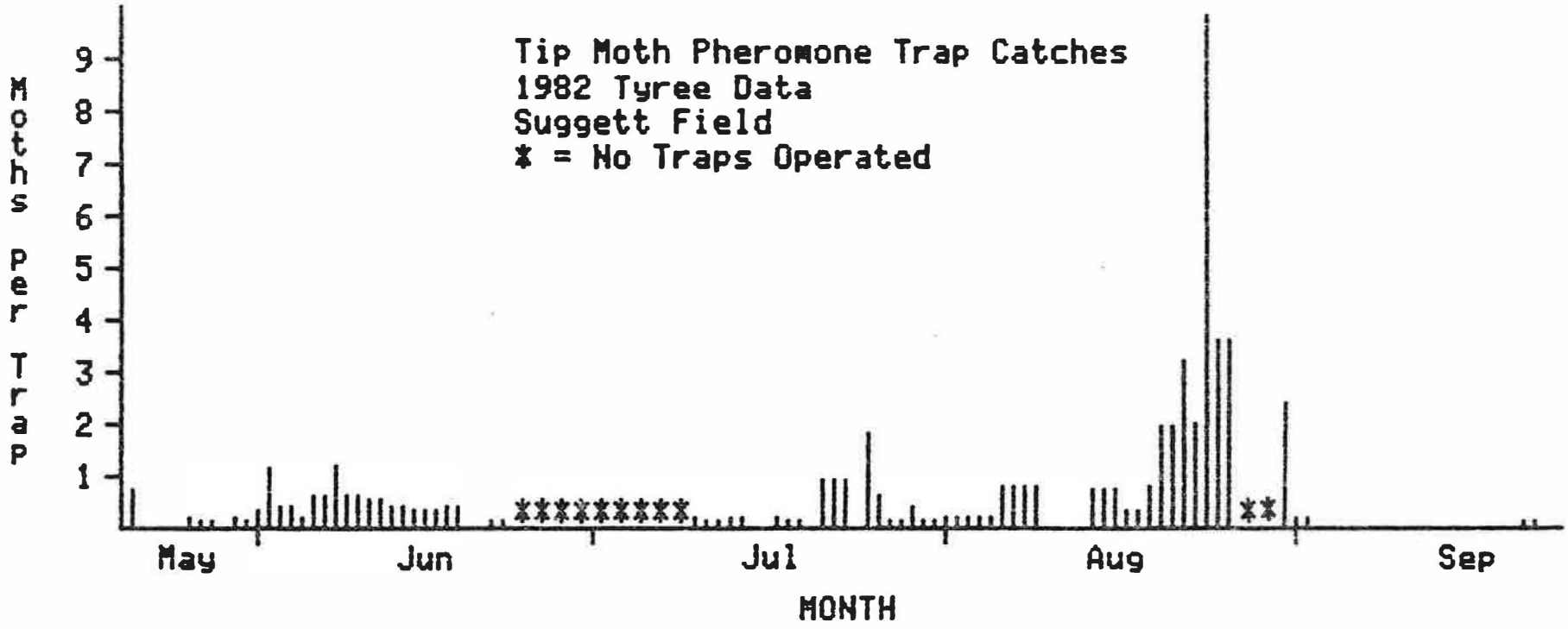
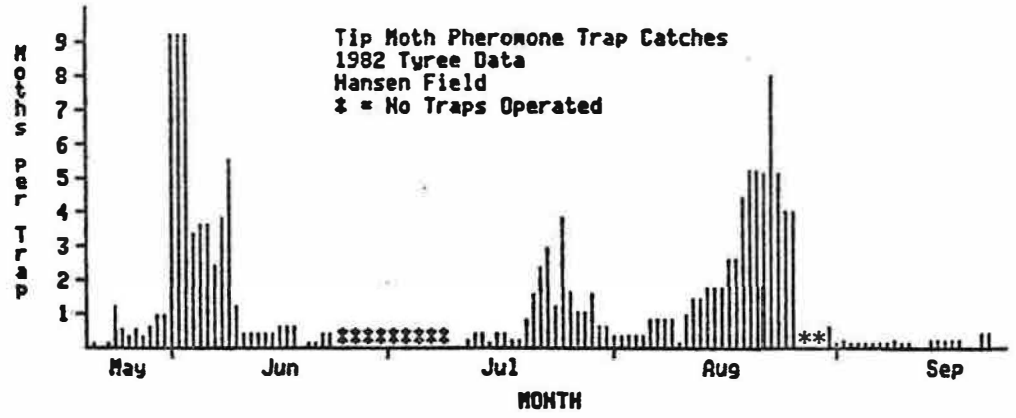


Figure 3. Mean numbers of male Nantucket pine tip moths caught in pheromone traps distributed in the Suggett field Christmas tree plantation at the Brockett-Tyree Farms near Winnsboro, Texas from mid-May through late September in 1982.



Tip moth flight periods near Nacogdoches, TX during 1979 (Anderson 1980).

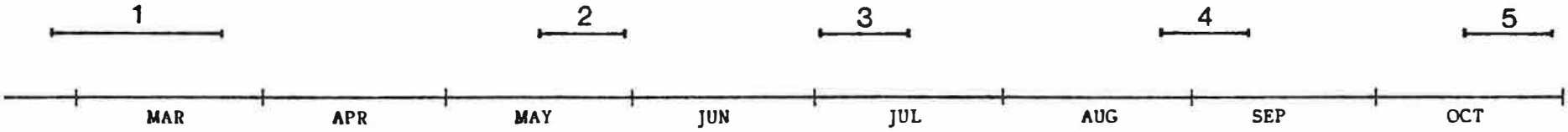


Figure 4. Mean numbers of male Nantucket pine tip moths caught in pheromone traps near Winnsboro, Texas from mid-May through late September during 1982 and tip moth flight periods near Nacogdoches, Texas during 1979.

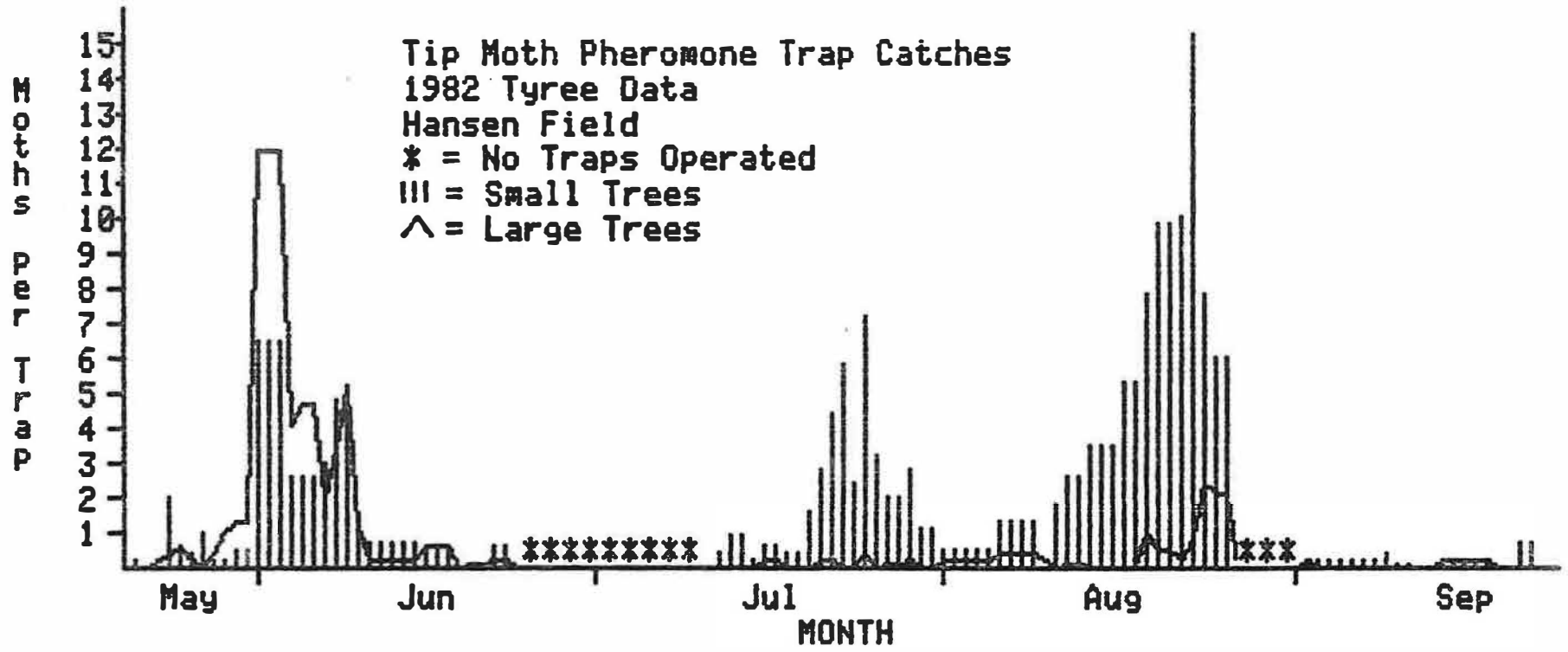


Figure 5. Mean numbers of male Nantucket pine tip moths caught in pheromone traps located in 2-3 year-old and 4 year-old Virginia pine Christmas tree plantations at the Brockett-Tyree Farms near Winnsboro, Texas in 1982.

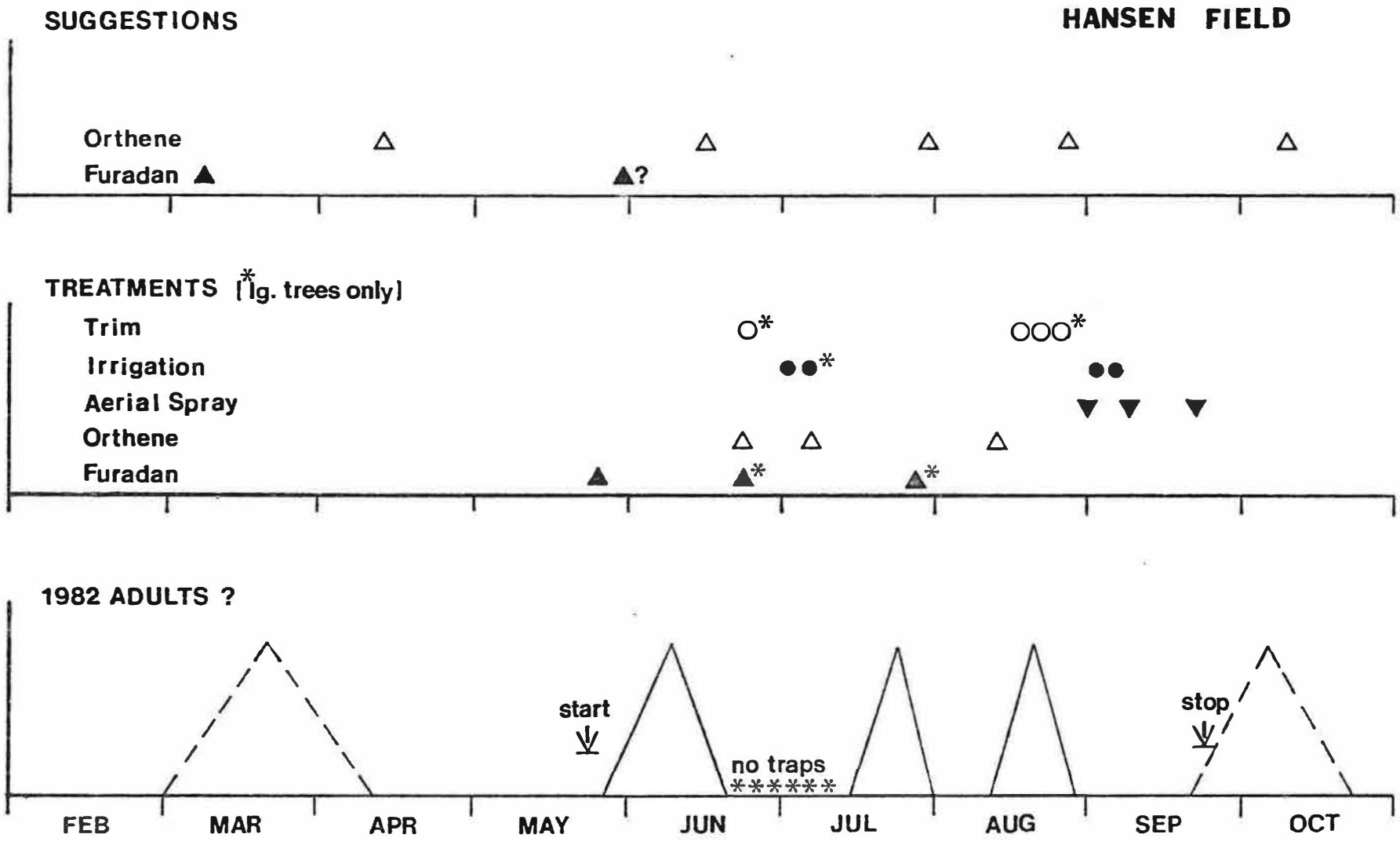


Figure 6. Probable 1982 Nantucket pine tip moth flight periods, management practices and post-mortem suggested insecticide treatments for the Virginia pine Christmas tree plantations in the Hansen field at the Brockett-Tyree Farms near Winnsboro, Texas.

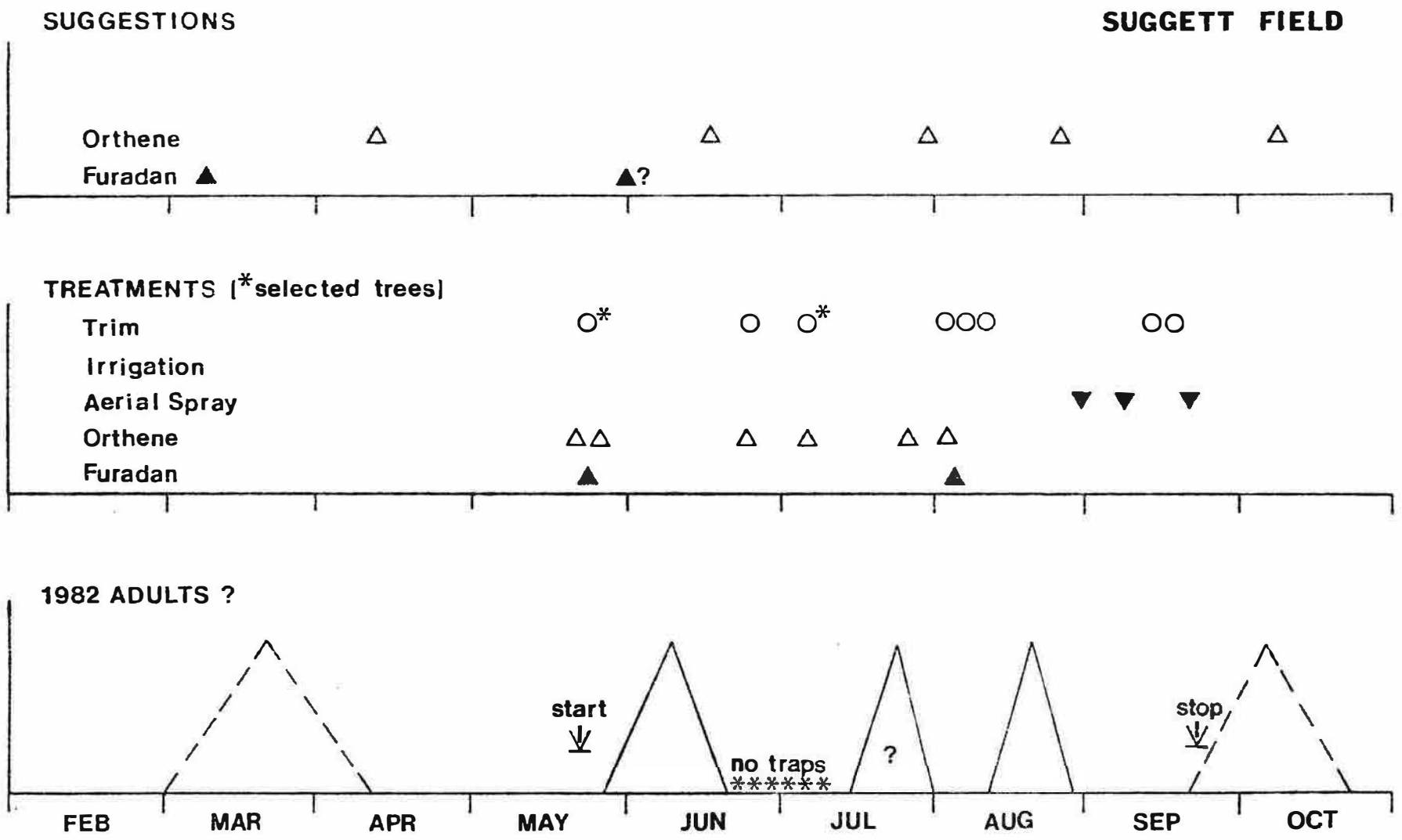


Figure 7. Probable 1982 Nantucket pine tip moth flight periods, management practices, and post-mortem suggested insecticide treatments for the Virginia pine Christmas tree plantations in the Suggett field at the Brockett-Tyree Farms near Winnsboro, Texas.

The low incidence of tip moth damage in the 4 year-old block in the Hansen field may be a result of several factors. A second Furadan application and subsequent irrigation in late June and a third Furadan application possibly with subsequent rainfall were applied only in the 4 year-old block of the Hansen field. The 4 year-old trees were also sheared in late June and again in late August. The late June shearing probably removed terminals containing small larvae, many of which may not have survived. Together these treatments are likely to have reduced tip moth populations in the 4 year-old block while little was done in the 2-3 year-old block to reduce population levels. This could possibly explain the drastic reduction in numbers of tip moths caught in pheromone traps in the 4 year-old block during July and August.

The three aerial spray applications of parathion in September apparently reduced the numbers of male moths captured in pheromone traps to very low levels, perhaps by killing adult moths as they emerged.

RECOMMENDATIONS

Based on this evaluation of tip moth flight periods and Christmas tree plantation treatments, post-mortem suggestions for insect control are illustrated in Figures 6 and 7, and are listed below:

1. One Furadan or Orthene treatment should have been applied to control the first tip moth generation, the larvae of which probably hatched during April.

2. A subsequent Furadan treatment may have been needed at the end of May and subsequent Orthene sprays may have been appropriate for mid-June, late July, late August and mid-October.

3. More sprays than those indicated for August through October may be required to provide adequate control during the late summer and early fall.

CONCLUSIONS

Furadan requires appropriate post-application rainfall to be effective for tip moth control. Certainly the lack of soil moisture will preclude uptake and translocation of the insecticide and perhaps too much rainfall could quickly move the insecticide out of the root zone in certain soil types. If pratical, irrigation may be the solution to inadequate rainfall as implied in this report.

Insecticide sprays are most effective when timed to coincide with the presence of young tip moth larvae before they enter the shoots. It is generally recommended to apply insecticides 5-10 days after peak adult moth emergence. However, when cool temperatures prevail in the spring, sprays

need to be deferred up to 3 weeks after peak moth flight due to a longer egg incubation period.

Pheromone traps may be used to determine the number of generations of the Nantucket pine tip moth in Texas and to assist in the timing of insecticide sprays. Tests conducted in Georgia have shown that Pydrin works best when applied to control the egg stage around the peak capture of male moths in pheromone traps, while Orthene and Cygon are most effective when applied to coincide with the young larval stage about 2 weeks after peak moth catch (Paul Gargiullo, personal communication, April 22, 1983).

Gargiullo and Berisford (1983) have developed a technique using pheromone traps for timing insecticide sprays to control tip moths in Georgia. The onset of each generation is determined when the first moth is caught in a pheromone trap. Degree-days are then accumulated day by day until the appropriate sum is reached. The following day is the optimum spray date. This technique has not been tested in Texas and warrants further study.

In the absence of pheromone traps, or in conjunction with them, moth flight periods can be determined by periodically shaking a number of trees in plantations and observing the tiny moths as they fly from the disturbed trees and come to rest on adjacent vegetation. Another method is to periodically dissect damaged terminals to determine the time when most terminals contain empty pupal cases.

Aerial application of insecticides appears to be an efficient and effective method for treating large Christmas tree plantations. Aerial sprays are fast, reduce exposure of plantation personnel to pesticides and the spray material is deposited in the tops of trees where it is most effective for controlling adult tip moths as well as larvae. However, special care should be taken to minimize drift to areas adjacent to plantations. Due to the possibility of spray drift, aerial applications may be impractical in populated areas.

Shearing operations are apt to kill a portion of the tip moth larvae in the shoots removed from trees and thereby reduce population levels. Controlled experiments are needed to determine the effects of shearing on different-sized tip moth larvae during the times when shearing operations are generally conducted in Christmas tree plantations in Texas. If this proves to be an effective method of controlling tip moth larvae, shearing operations should be timed within acceptable intervals to coincide with the most susceptible tip moth stage. This technique might allow for the elimination of one or two insecticide treatments.

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